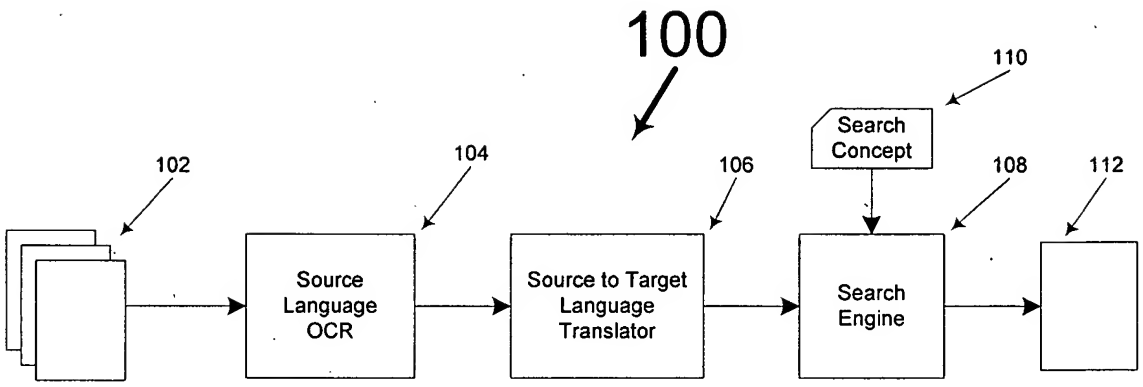

100
110
Search Concept
102
104
106
108
112
Source Language OCR
Source to Target Language Translator
Search Engine

Figure 1

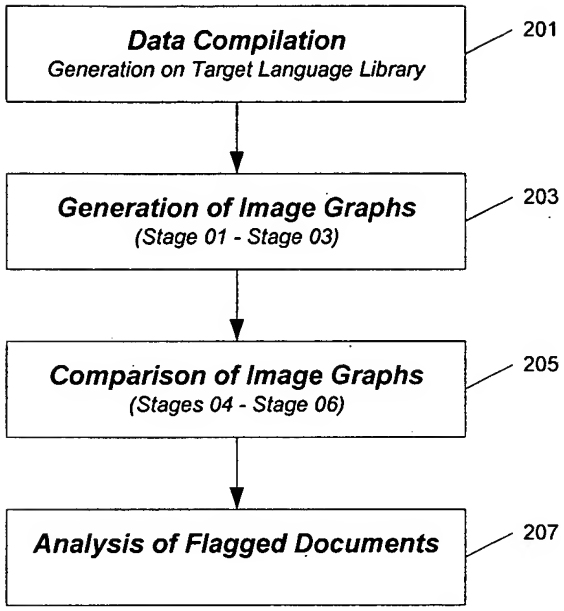

Data Compilation
Generation on Target Language Library
201
Generation of Image Graphs
(Stage 01 - Stage 03)
203
Comparison of Image Graphs
(Stages 04 - Stage 06)
205
Analysis of Flagged Documents
207

Figure 2

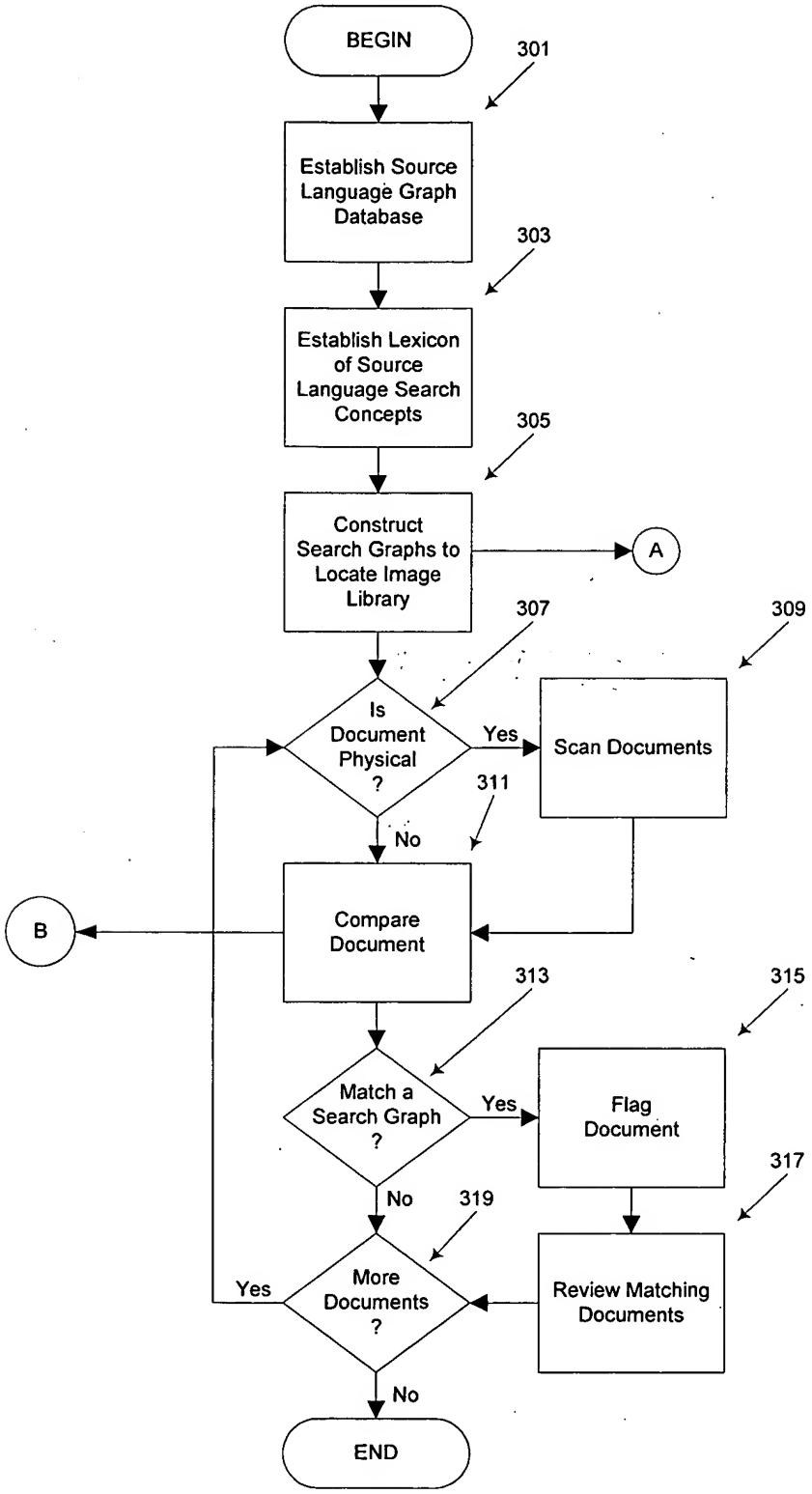

BEGIN
301
Establish Source Language Graph Database
303
Establish Lexicon of Source Language Search Concepts
305
Construct Search Graphs to Locate Image Library
A
307
309
Is Document Physical ?
Yes
Scan Documents
311
No
B
Compare Document
313
315
Match a Search Graph ?
Yes
Flag Document
317
No
319
Yes
More Documents ?
Review Matching Documents
No
END

Figure 3

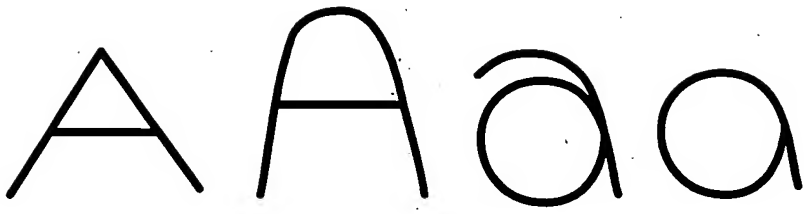
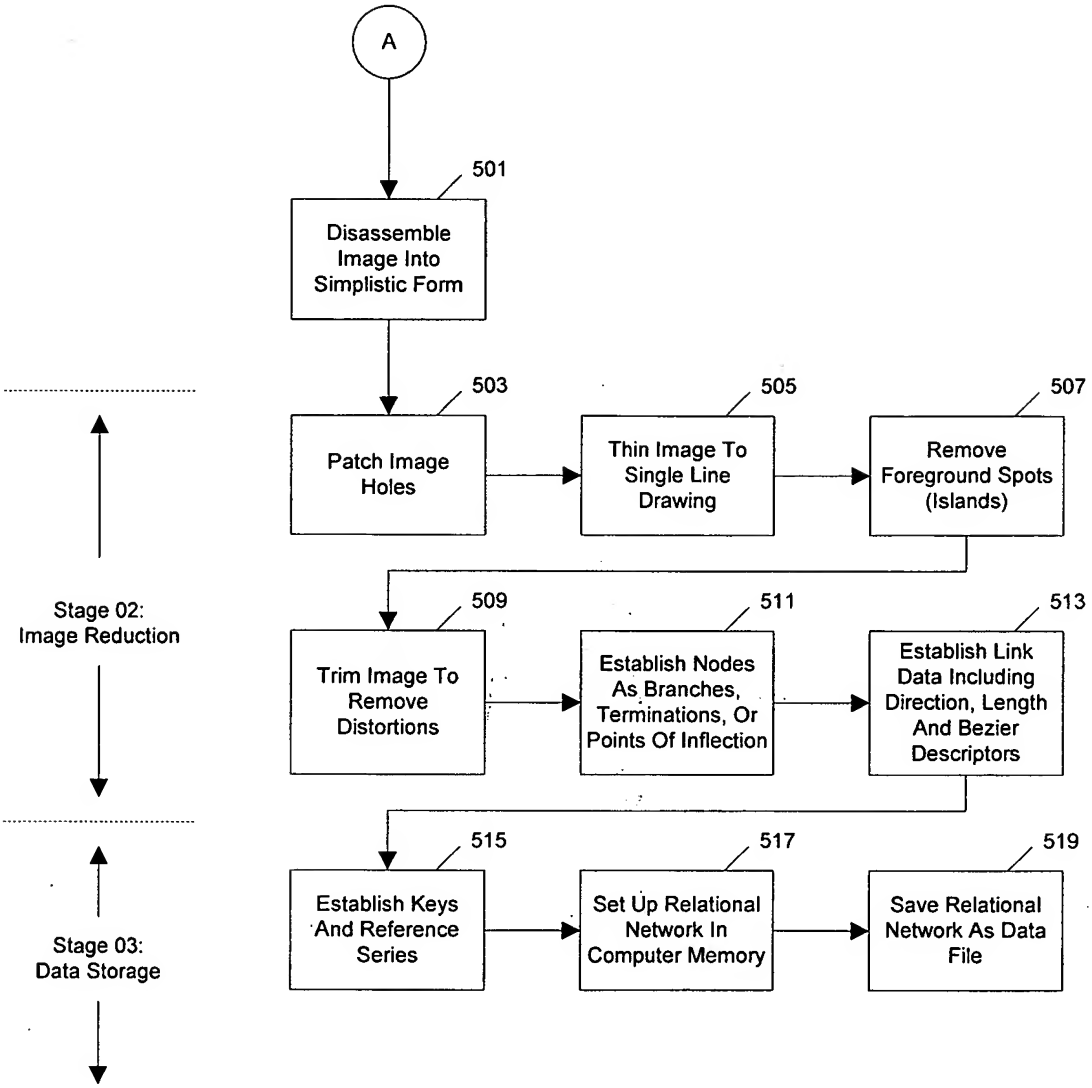
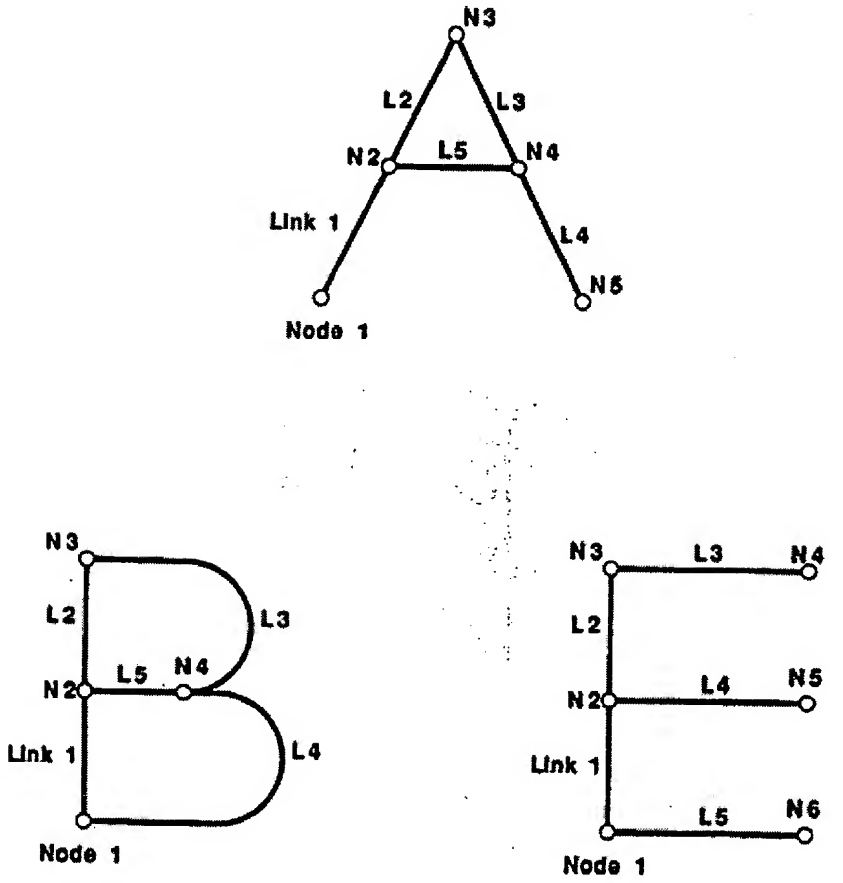


Figure 4



CREATION OF IMAGE LIBRARY

Figure 5



Link/node structure for characters "A", "B" and "E"

Figure 6

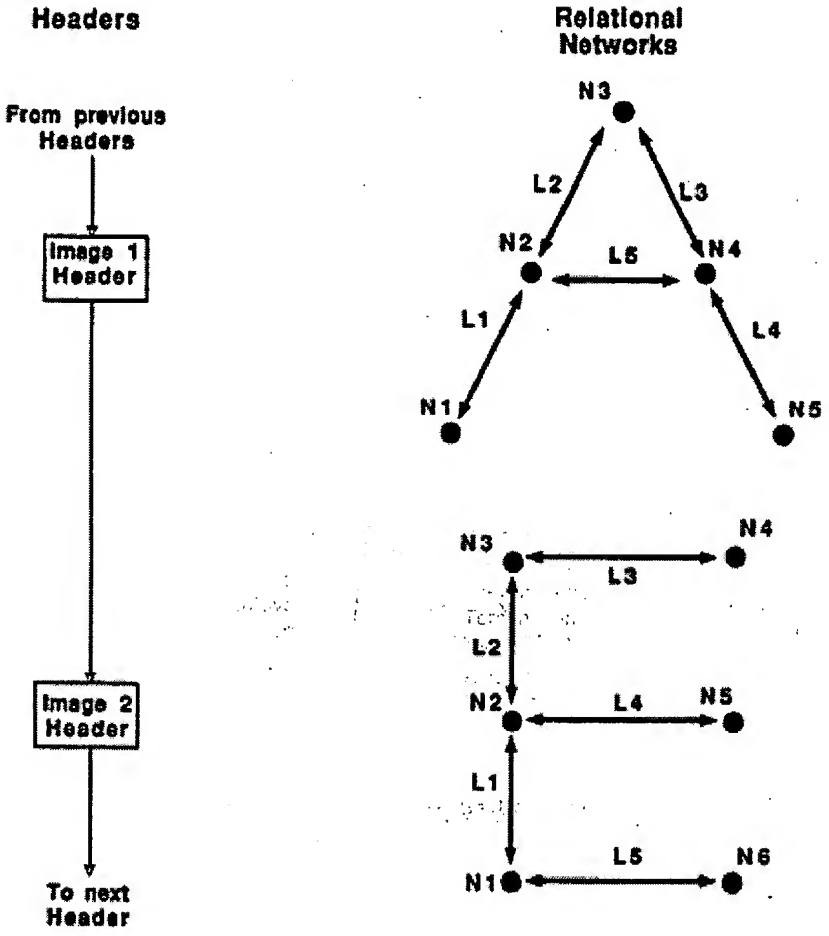


Illustration of data structure

Patent provided by Sughrue Mion, PLLC - http://www.sughrue.com

Figure 7

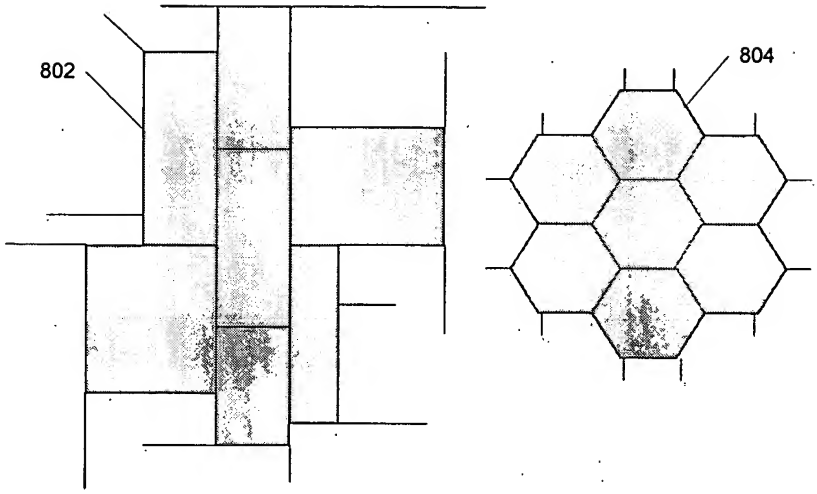
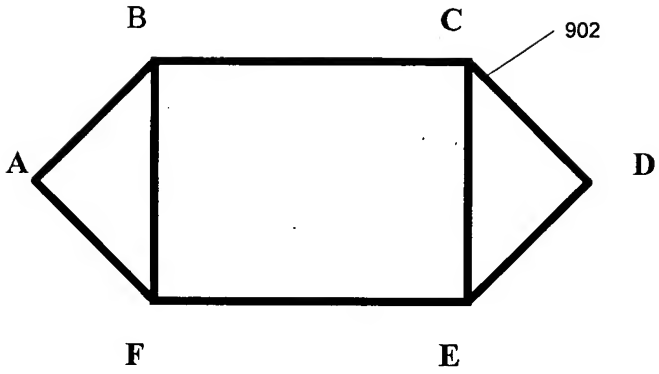


FIG. 8

Sample Graph:



Connectivity Indices

Vertex	Connectivity Array		
	3	2	1
A	0	1	0
B	3	1	0
C	3	1	0
D	0	1	0
E	3	1	0
F	3	1	0

FIG. 9

Before

A	0	1	0	0	0	1
B	0	0	1	0	0	1
C	0	0	0	1	1	0
D	0	0	0	0	1	0
E	0	0	0	0	0	1
F	0	0	0	0	0	0

After

	C	E	B	F	D	A
C	0	1	1	0	1	0
E	0	0	0	1	1	0
B	0	0	0	1	0	0
F	0	0	0	0	0	1
D	0	0	0	0	0	0
A	0	0	0	0	0	0

FIG. 10

Examples of Glyphs Embedded in Cursive Word

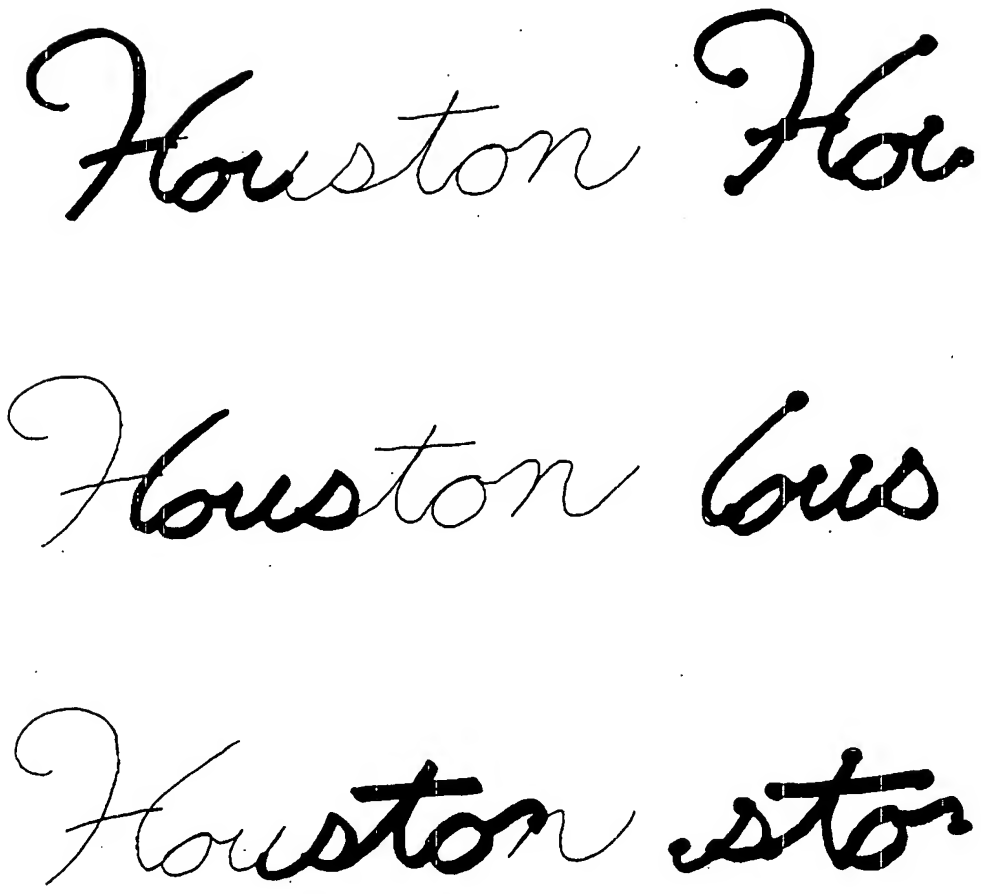


FIG. 11

Examples of Known Characters
Embedded in Unknown Graphs

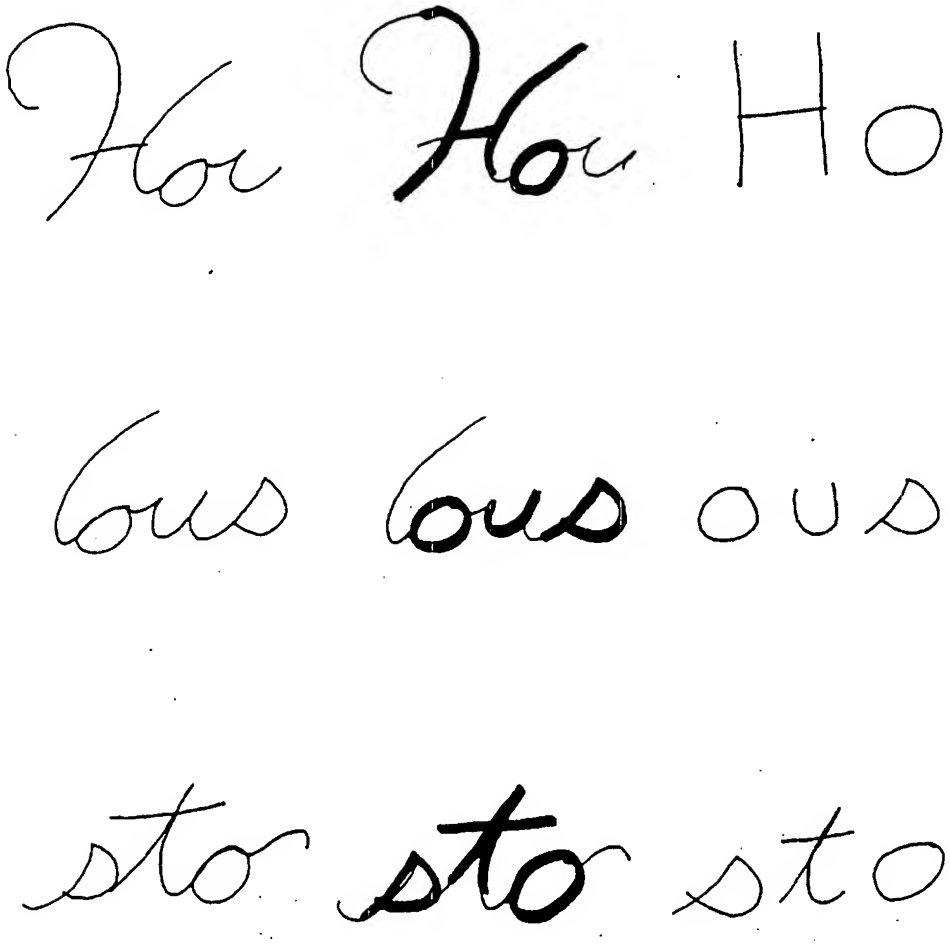


FIG. 12

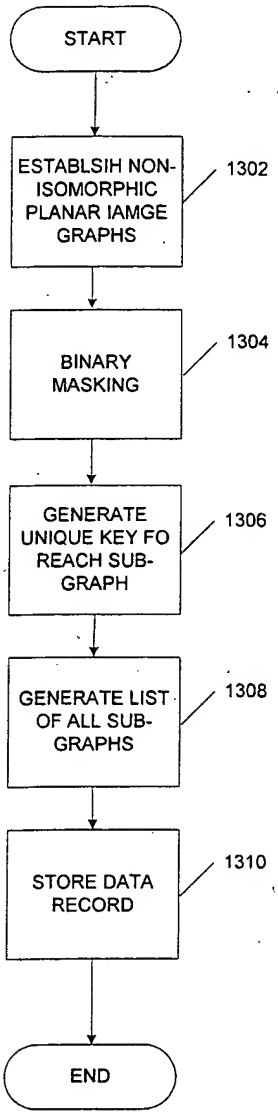

START
ESTABLSIH NON-ISOMORPHIC PLANAR IAMGE GRAPHS
1302
BINARY MASKING
1304
GENERATE UNIQUE KEY FO REACH SUB-GRAPH
1306
GENERATE LIST OF ALL SUB-GRAPHS
1308
STORE DATA RECORD
1310
END

FIG. 13

15 Non-Isomo. Inc forms of Maximal Simple Connected Planar

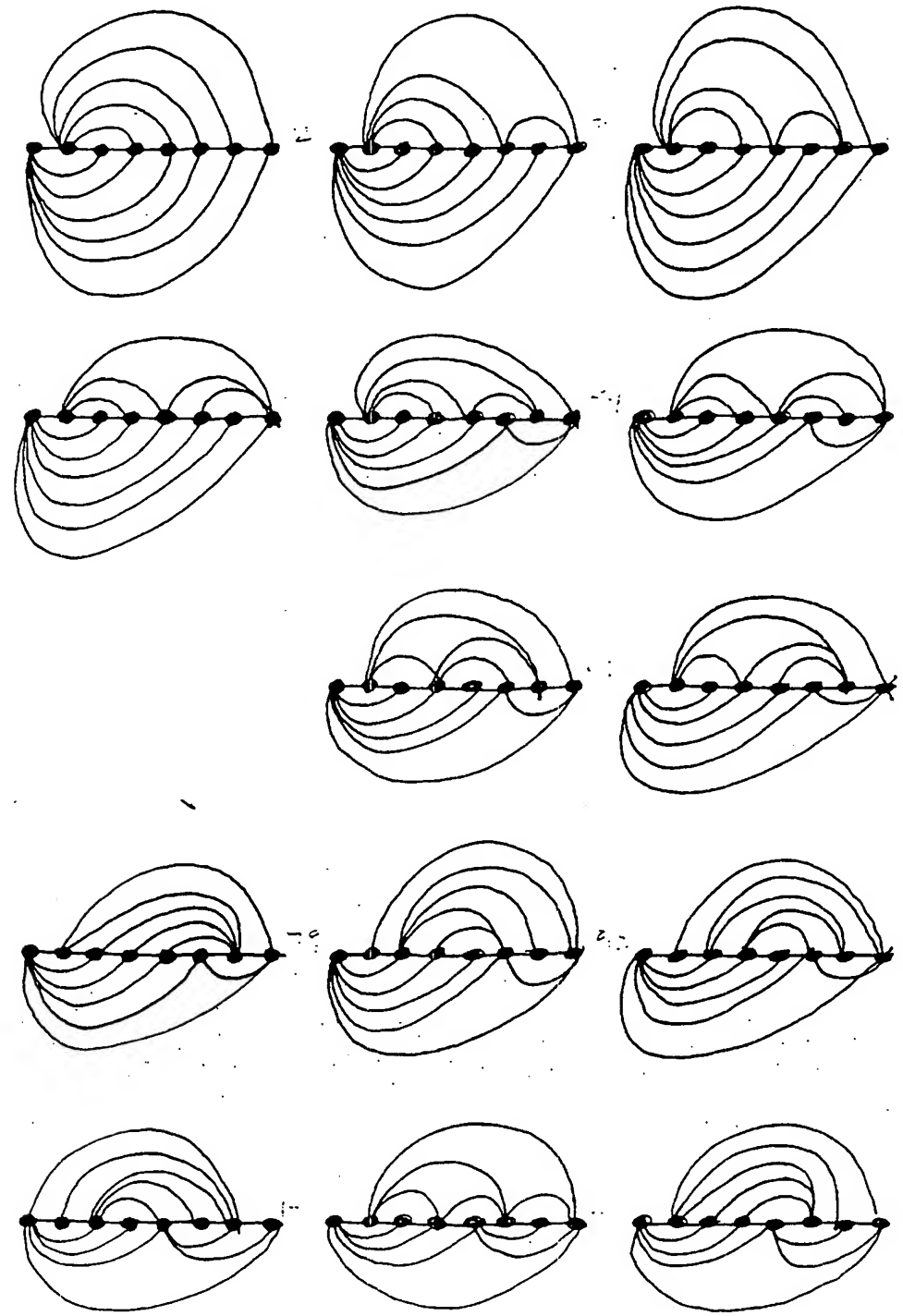
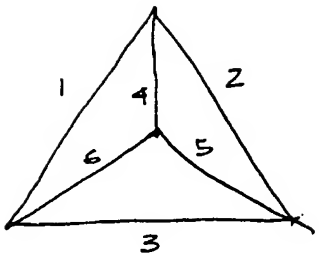
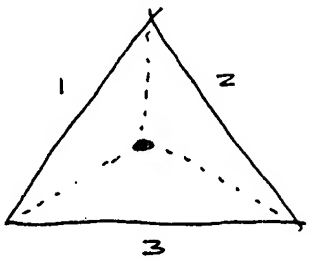


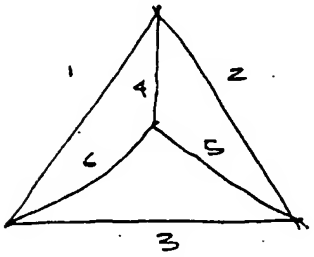
FIG. 14

Examples of Edge Masking to Isolate Embedded Graphs

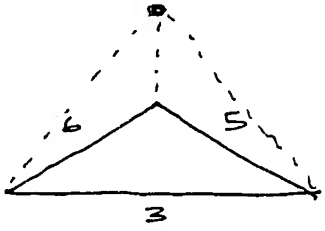


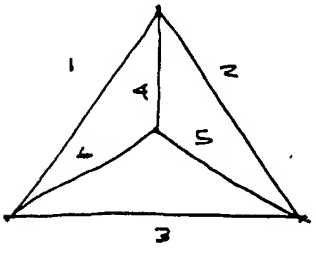
Edge 1 2 3 4 5 6
Mask 1 1 1 0 0 0



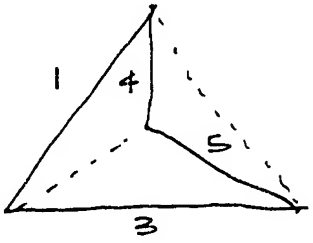


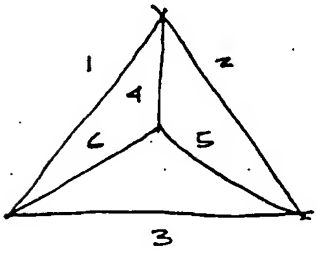
Edge 1 2 3 4 5 6
Mask 0 0 1 0 1 1





Edge 1 2 3 4 5 6
Mask 1 0 1 1 1 0





Edge 1 2 3 4 5 6
Mask 1 0 1 0 0 1

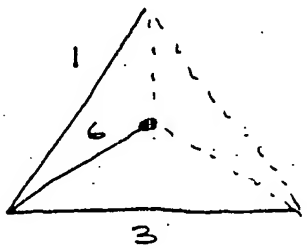
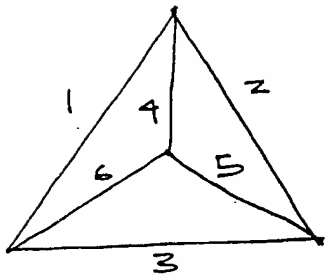
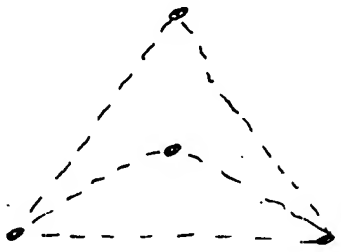


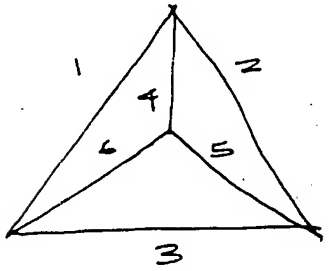
FIG. 15

Example of Mask Using Bits in Binary Encoding of Counter

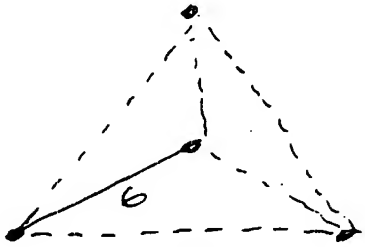


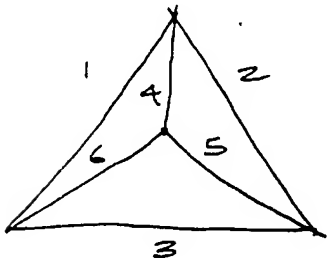
Counter 0
Edge 1 2 3 4 5 6
Mask 0 0 0 0 0 0



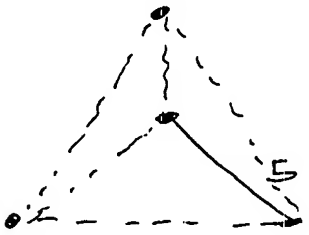


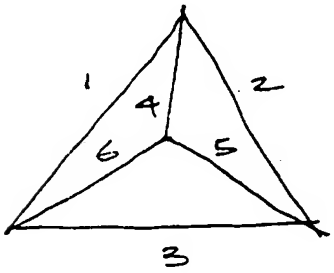
Counter 1
Edge 1 2 3 4 5 6
Mask 0 0 0 0 0 1





Counter 2
Edge 1 2 3 4 5 6
0 0 0 0 1 0





Counter 3
Edge 1 2 3 4 5 6
0 0 0 0 1 1

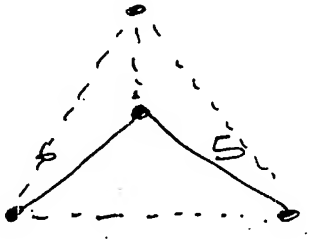
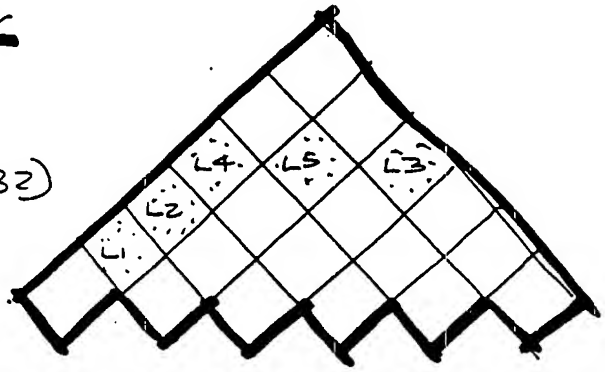


FIG. 16

Relationship of Translation Sequence to Weighted Key Matrix

Weighted Matrix for Character "E"
(Figure 14 from U.S. Patent 5,267,332)



Original Order	1	2	3	4	5	6
New Order	2	1	3	5	6	4

Translation Table

Adjacency Table
Node Sequence

Original Sequence	New Sequence
2	1
1	2
3	3
5	4
6	5
4	6

FIG. 17

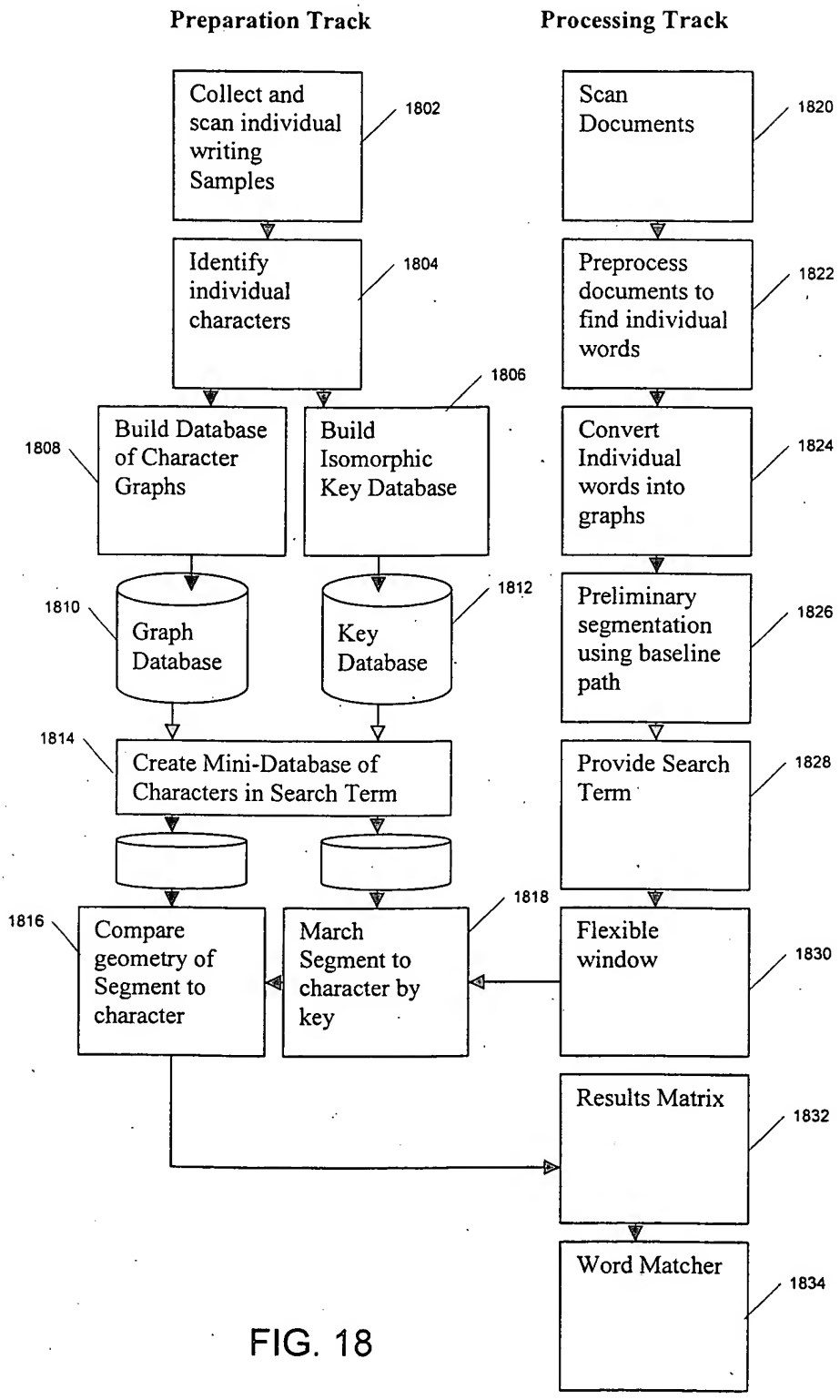

Preparation Track
Processing Track
Collect and scan individual writing Samples
1802
Identify individual characters
1804
1806
Build Database of Character Graphs
1808
Build Isomorphic Key Database
Graph Database
1810
Key Database
1812
Create Mini-Database of Characters in Search Term
1814
Compare geometry of Segment to character
1816
March Segment to character by key
1818
Scan Documents
1820
Preprocess documents to find individual words
1822
Convert Individual words into graphs
1824
Preliminary segmentation using baseline path
1826
Provide Search Term
1828
Flexible window
1830
Results Matrix
1832
Word Matcher
1834

FIG. 18

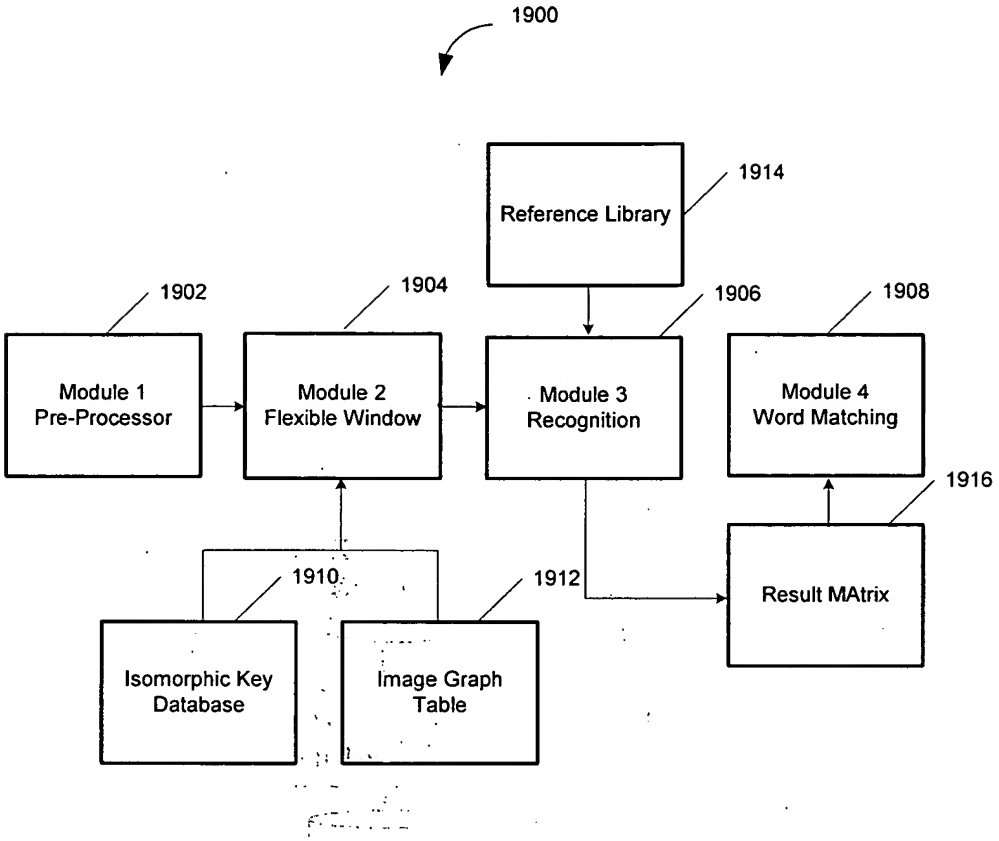
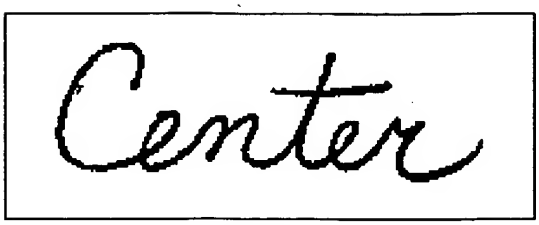
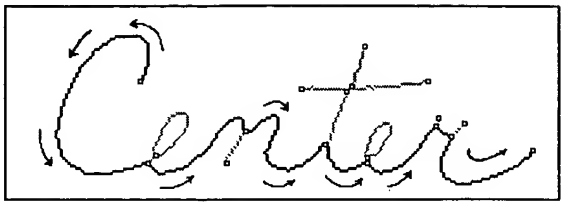

1900
Reference Library
1914
1902
1904
1906
1908
Module 1
Pre-Processor
Module 2
Flexible Window
Module 3
Recognition
Module 4
Word Matching
1916
1910
1912
Result MAtrix
Isomorphic Key
Database
Image Graph
Table

FIG. 19

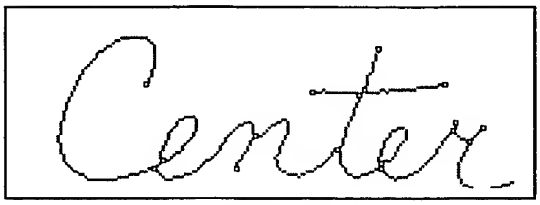
: Creation of the Baseline Path



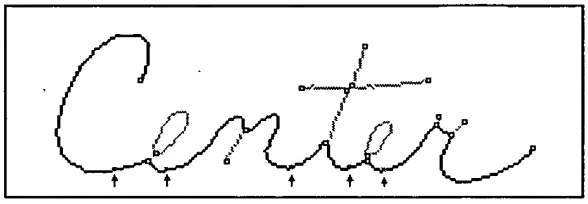
Item a.



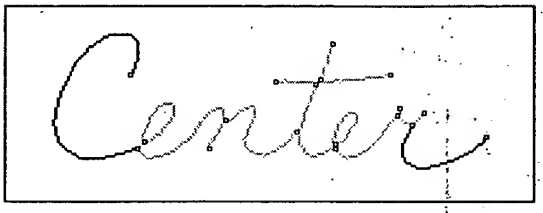
Item e.



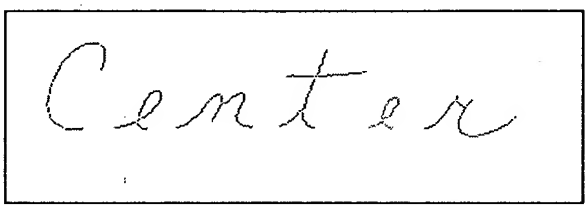
Item 1b.



Item f.



Item c.



Item g.

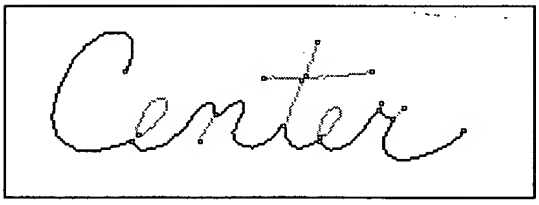
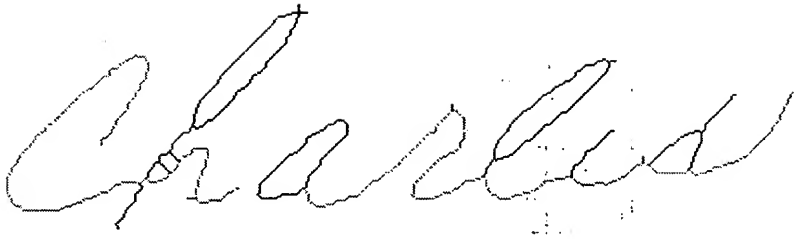


FIG. 20

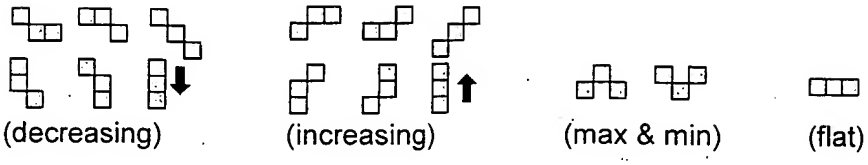
Item a.



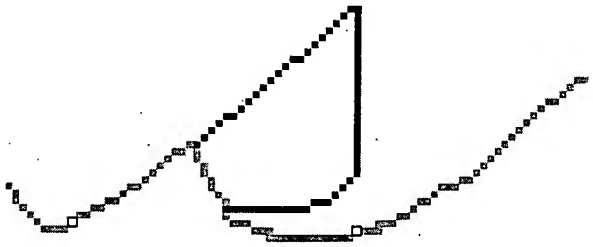
Item b.

FIG. 21

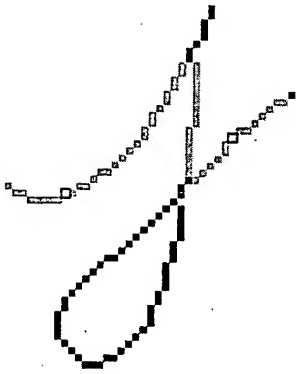
Pixel Patterns for Segmenting Zones



Item a.

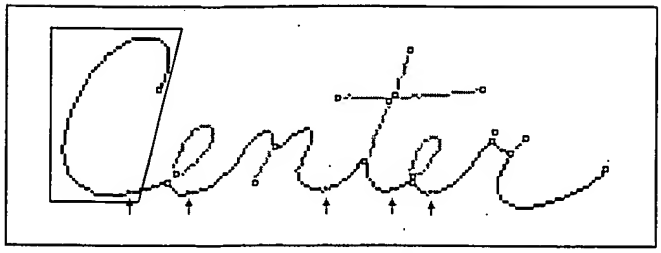


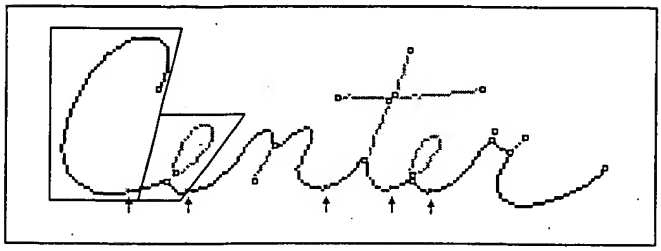
Item b.

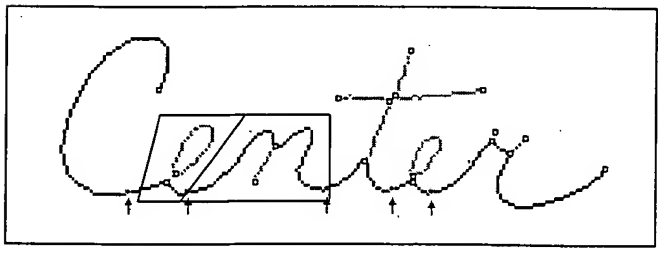


Item c.

FIG. 22







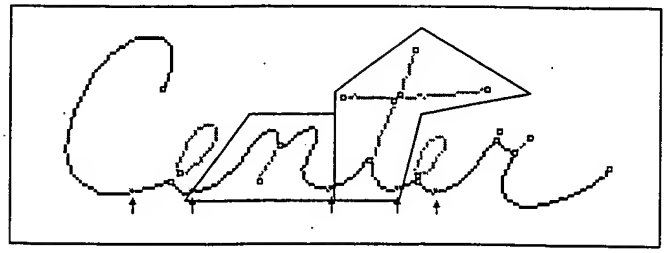


FIG. 23